

Importation of Papaya Fruit (*Carica papaya*) From Brazil into the Continental United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the importation into the United States of fresh papaya (*Carica papaya*) fruit grown in Brazil. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low as opposed to numerical terms such as probabilities or frequencies.

International plant protection organizations (e.g., North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO)) provide guidance for conducting pest risk analyses. The methods we used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. Our use of biological and phytosanitary terms (e.g., introduction, quarantine pest) conforms with the *NAPPO Compendium of Phytosanitary Terms* (NAPPO 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1995).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO (1995) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

The Food and Agriculture Organization (FAO, 1995) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential". "Quarantine pest" is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1995; NAPPO, 1995). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative pest risk assessment.

This document presents the findings of our qualitative plant pest risk assessment. We have not described in detail our assessment methods or the criteria we used to rate the various risk elements. Details of our methodology and rating criteria can be found in our "template" document: *Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0* (USDA, 1995); to obtain a copy of our template, contact the individual named on the front of this risk assessment.

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; we initiated the assessment in response to the request for USDA authorization to allow imports of a particular commodity presenting a potential plant pest risk. In this case, the importation into the United States of fresh papaya fruit grown in Brazil is a potential pathway for introduction of plant pests. Quarantine 56 (7 CFR §319.56) provides a general regulatory authority for importation of fruits and vegetables.

Papaya, also known as pawpaw, is the primary agricultural plant in the family Caricaceae. The Family consists of two genera and about 30 species. The genus *Carica* includes 25 species native in tropical and subtropical America (Bailey, 1949). Papaya is grown commercially throughout the world in the tropics and subtropics.

2. Assessment of Weediness Potential of Papaya

The initial step after receiving a request for importation of a commodity is to analyze the weediness potential of the species. Table 1 shows how the weediness potential was assessed and presents the findings for *Carica papaya*.

Table 1: Process for Determining Weediness Potential of Imported Plant	
Plant Species: <i>Carica papaya</i> (Caricaceae)	
Phase 1: Status of Plant Species in United States	
<i>Carica papaya</i> is grown commercially in Florida and Hawaii. Papaya is also grown in greenhouses throughout the United States, primarily as a curiosity.	
Phase 2: Weediness Potential	
Is the species listed in:	
<u>NO</u>	<i>Geographical Atlas of World Weeds</i> (Holm <i>et al.</i> , 1979)
<u>NO</u>	<i>World's Worst Weeds</i> (Holm <i>et al.</i> , 1977)
<u>NO</u>	<i>Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act</i> (Gunn & Ritchie, 1982)
<u>NO</u>	<i>Economically Important Foreign Weeds</i> (Reed, 1977)
<u>NO</u>	Weed Science Society of America list (WSSA, 1989)
<u>NO</u>	Is there any literature reference indicating weediness (<i>e.g.</i> , AGRICOLA, CAB, Biological Abstracts, AGRIS; search on "species name" combined with "weed").
Phase 3: Conclusion	
Because <i>Carica papaya</i> is grown commercially, and for a variety of other purposes throughout the United States and because the scientific literature provides no indication of weediness potential, we proceed with the pest risk assessment.	

3. Previous Risk Assessments, Current Status and Pest Interceptions

Previous Risk Assessments

Several previous risk assessments have been completed for fresh papaya from countries in South American countries. Because of quarantine pests for which there were no approved treatments, fresh papaya was denied entry from Chile (1930), Ecuador (1930), Peru (1930), Colombia (1934), and Brazil (1934). More recent risk assessments recommended that papaya fruit might be enterable after treatment for quarantine significant fruit flies and other pests. Enterability was recommended following treatment from Peru (1969), Brazil (1973), Chile (1982, and Ecuador (except Hawaii, 1984). However, because of changes in risk management tools available for phytosanitary treatments (see below) new recommendations must be considered.

Current Enterability Status of *Carica papaya*

Until the 1980's, papaya fruit (and other agricultural commodities) could be treated with ethylene dibromide (EDB) to mitigate against entry of quarantine pests. Papaya fruit entered the United States following treatment with EDB. However, since then, the status of EDB for phytosanitary treatments has changed and it is no longer possible to use EDB to treat fresh commodities for phytosanitary purposes. Thus, risk management plans involving use of EDB must be revised.

Pest Interceptions on *Carica papaya*

In recent years, the following interceptions have been made on papaya from Brazil:

- ▶ *Aonidiella comperei* McKenzie (Diaspididae) on fruit, multiple times at various United States ports.
- ▶ *Aonidiella* sp.
- ▶ Pseudococcidae spp. on leaves of *C. papaya* (at least four times in 1989)
- ▶ *Phoma* sp.

4. Pest List: Pests Associated with *Carica papaya* in Brazil

Table 2 shows our pest list for Brazilian papaya. We generated the list after review of the information sources listed in USDA (1995). The pest list includes limited information on the distribution of each pest, pest-commodity association, and regulatory history. Distribution data for United States pests in Table 2 refer only to pests' distribution in the continental United States. Designation of a pest as occurring in the United States does not necessarily indicate its presence in all States or territories (*e.g.*, Hawaii) of the United States. Conversely, pests occurring only in States or territories outside the continental United States are not listed in Table 2 as occurring in the United States.

Table 2: Pest List - Papaya, Brazil			
Scientific Name, Classification/Common Name	Distribution¹	Comment²	References
Arthropods			
<i>Agrotis ipsilon</i> (Rottemburg) (Lepidoptera: Noctuidae)	BR US	a f o	C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Metcalf & Metcalf, 1993;
<i>Anastrepha fraterculus</i> (Wiedemann) (Diptera: Tephritidae)	BR	n z _i	FAO, 1993; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96;
<i>Aonidiella comperei</i> McKenzie (Homoptera: Diaspididae)	BR	j x	(FAO, sp. not listed); 309 interception records
<i>Brevipalpus phoenicis</i> (Geijskes) (Acari: Tenuipalpidae)	BR US	f o	Jeppson <i>et al.</i> , 1975
<i>Ceratitis capitata</i> (Wiedemann) (Diptera: Tephritidae)	BR US ³	h n z _i	White & Elson-Harris, 1992; Liquido <i>et al.</i> , 1995; FAO 1993; EPPO, 1994; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96
<i>Empoasca papayae</i> ⁴ (Homoptera: Cicadellidae)	BR	a n	C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; EPPO, 1994
<i>Erinnyis alope</i> (Drury) (Lepidoptera: Sphingidae)	BR US	f o	Da Costa Lima, 1936; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Zhang, 1995.
<i>Erinnyis ello</i> (L.) (Lepidoptera: Sphingidae)	BR US	f o	Da Costa Lima, 1936; EPPO Pest Data Sheet, 1995; FAO, 1993; Zhang, 1995
<i>Hanseniella</i> sp. Class Symphyla	BR	a	Loureiro <i>et al.</i> , 1971

Table 2: Pest List - Papaya, Brazil			
Scientific Name, Classification/Common Name	Distribution¹	Comment²	References
<i>Lycorella</i> (= <i>Lycorea</i>) <i>cleobaea</i> (Godart) (Lepidoptera: Heliconiidae [Nymphalidae]))	BR	a	Da Costa Lima, 1936; Zhang, 1995; Zhang, 1995
<i>Lycorella</i> (= <i>Lycorea</i>) <i>halia referrens</i> (Godart) (Lepidoptera: Heliconiidae [Nymphalidae])	BR	a	Da Costa Lima, 1936; Zhang, 1995
<i>Morganella longispina</i> (Morgan) (Homoptera: Diaspididae)	BR US	f o	Da Costa Lima, 1936; Nakahara, 1982
<i>Polyphagotarsonemus latus</i> (Banks) (Acari: Tarsonemidae)	BR US	f o	Jeppson <i>et al.</i> , 1975; (BR tech report); C. Coutinho, (Letter to N. Gutierrez, APHIS, 3/21/96)
<i>Stiphra robusta</i> Mello-Leitao (Orthoptera: Proscopiidae)	BR	a e	Bastos, 1975; SDSV, 1968
<i>Tetranychus desertorum</i> Banks (Acari: Tetranychidae)	BR US	f o	Jeppson <i>et al.</i> , 1975; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96;
<i>Tetranychus evansi</i> Baker & Pritchard (Acari: Tetranychidae)	BR US	f o	Jeppson <i>et al.</i> , 1975
<i>Tetranychus neocalidonicus</i> Andre (Acari: Tetranychidae)	SX US	f o	Jeppson <i>et al.</i> , 1975
<i>Tetranychus urticae</i> Koch (Acari: Tetranychidae)	BR US	f z _e	Jeppson <i>et al.</i> , 1975; (BR tech report); Metcalf & Metcalf, 1993; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96;
<i>Tiquadra nivos</i> a (Felder & Rogenhoffer) (Lepidoptera: Tineidae)	BR	a b	Da Costa Lima, 1936;
<i>Toxotrypana curvicauda</i> Gerstaecker (Diptera: Tephritidae)	BR US	f o	White & Elson-Harris, 1992
<i>Xylophanes chiron</i> (Walker) (Lepidoptera: Sphingidae)	BR	a n	Da Costa Lima, 1936;
Fungi			
<i>Asperisporium caricae</i> Speg. & Maubl. Leaf and fruit spot	BR US	f o z _{ei}	C.M.I., 1985a; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Farr, <i>et al.</i> , 1989

Table 2: Pest List - Papaya, Brazil			
Scientific Name, Classification/Common Name	Distribution¹	Comment²	References
<i>Asterina caricae</i> Rehm. (Anamorph: <i>Astromella caricae</i> Henn.) Black mildew, petiole spot	BR US	a b f o	Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Botryodiplodia</i> spp. Stem canker	BR	a	Ploetz, <i>et al.</i> , 1994
<i>Botrytis cinerea</i> Pers.:Fr. Wet season bud blast	SX US	c f o v	Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Cercospora mamaonis</i> Viegas & Chupp Fruit and leaf spot	BR	z _{ei}	Farr, <i>et al.</i> , 1989; Watson, 1971
<i>Cercospora papayae</i> Hansf. Cercospora black spot	BR US	c f o	Farr, <i>et al.</i> , 1989; Ploetz, <i>et al.</i> , 1994
<i>Colletotrichum acutatum</i> J.H. Simmonds	BR US	f o	EPPO PQR Database, 1994; Farr, <i>et al.</i> , 1989
<i>Colletotrichum gloeosporioides</i> (Penz.) Penz. & Sacc. in Penz. Anthracnose	BR US	c f o	C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Corynespora casiicola</i> (Berk. & M.A. Curtis) C.T. Wei Target spot	BR US	a c f o	Duarte, <i>et al.</i> , 1983; Farr, <i>et al.</i> , 1989
<i>Lasiodiplodia theobromae</i> (Pat.) Griffon & Maubl. Fruit rot, trunk necrosis	BR US	c f o	Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Leptosphaeria</i> spp. Areolate leaf spot	BR	a	Wellman, 1977
<i>Melophia superba</i> Speg. Leaf scorch	BR	a	Wellman, 1977
<i>Mycosphaerella caricae</i> Syd. & P. Syd. Anamorph: <i>Phoma caricae-</i> <i>papayae</i> (Tarr) Punithalingham (Syn.: <i>Ascochyta caricae</i> Pat., <i>A.</i> <i>caricae-papayae</i> Tarr) Dry rot	BR US	f o	C.M.I., 1993; C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Farr, <i>et al.</i> , 1989; Ploetz, <i>et al.</i> , 1994; Wellman, 1977
<i>Oidium caricae</i> F. Noack Powdery mildew	BR US	f o	C. Coutinho, Letter to N. Gutierrez, APHIS, 3/21/96; Farr, <i>et al.</i> , 1989; Ploetz, <i>et al.</i> , 1994

Table 2: Pest List - Papaya, Brazil			
Scientific Name, Classification/Common Name	Distribution¹	Comment²	References
<i>Phaeoseptoria papaya</i> Speg. Leaf spot	BR	a	Wellman, 1977
<i>Phomopsis carica-papayae</i> Petrak Wet fruit rot	BR	z _{ei}	C.M.I., 1985b; Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Phyllosticta carica-papayae</i> Allesch. Shot hole, leaf spot, target spot	BR US	a f o	Farr, <i>et al.</i> , 1989; Wellman, 1977
<i>Phytophthora palmivora</i> (E.J. Butler) E.J. Butler Fruit, root and stem rot	BR US	c f o	Alfieri, <i>et al.</i> , 1995; Farr, <i>et al.</i> , 1989; French, 1989; Ploetz, <i>et al.</i> , 1994
<i>Septoria caricae</i> Speg. Leaf spot	SX	a v	Wellman, 1977
Bacteria			
<i>Pseudomonas caricapapayae</i> Robbs Leaf spot, stem rot	BR	a	Bradbury, 1986; Wellman, 1977
Nematodes			
<i>Meloidogyne javanica</i> (Treub) Chitwood Root knot nematode	BR US	a f o	Anonymous, 1984; Ponte, 1963
<i>Rotylenchus reniformis</i> (Cobb) Linford & Oliveira Reniform nematode	BR US	a f o	Anonymous, 1984; Bittencourt, <i>et al.</i> , 1985; Ploetz, <i>et al.</i> , 1994
Virus and viruslike agents			
Papaya ringspot virus (Syn.: Papaya distortion virus)	BR US	d f o	Barbosa, <i>et al.</i> , 1982; Ploetz, <i>et al.</i> , 1994
Papaya mosaic virus	SX US	d f o v	Brunt, <i>et al.</i> , 1996
Tomato spotted wilt virus	BR US	d f o	Brunt, <i>et al.</i> , 1996; Lima, <i>et al.</i> , 1988
Diseases of unknown etiology			
Freckles	BR	d	Ploetz, <i>et al.</i> , 1994

Table 2: Pest List - Papaya, Brazil

Scientific Name, Classification/Common Name	Distribution ¹	Comment ²	References
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Table Footnotes**¹ Distribution Codes:**

BR=Brazil

SX=South America

US=United States

² Comments:

- a- Pest mainly associated with plant part other than commodity
- b- Not likely to be a primary plant pest
- c- Listed in Catalogue of Intercepted Pests as non-actionable
- d- Commodity is unlikely to serve as inoculum source because vector is unknown or does not feed on commodity and/or seed transmission has not been reported in *Carica* spp.
- e- Although pest attacks commodity, it would not be expected to remain with the commodity (plant part) during processing
- f- Pest occurs in the U.S. and is not subject to official restrictions and regulations (*i.e.*, not listed as actionable, and no official control program).
- h- Quarantine pest; pest has limited distribution in the United States and is under official control as follows: (1) pest listed by name in USDA's pest dictionary, official quarantine action taken on this pest when intercepted on this commodity and, (2) pest is a "program pest" (there is an official Federal or State program for control of this pest beyond its being listed in the pest dictionary as actionable).
- j- Armored scale insect: no quarantine action on fruit for consumption because "...armored scales in general have a low probability of establishment from infested shipments of commercial fruit" (ARS, 1985)
- n- Pest is officially controlled by prior inclusion into Actionable Pest Dictionary.
- o- Organism does not meet the geographical and regulatory definition of a quarantine pest.
- x- Interception records exist
- z₁- Internal feeder: Pest is known to attack or infect commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping
- z₂- External feeder: Pest is known to commonly attack or infect commodity and it would be reasonable to expect the pest may remain with the commodity during processing and shipping

³ *Ceratitis capitata* has been detected on occasion in the United States. Whenever *C. capitata* has been detected, a quarantine was established and an eradication program was implemented. *C. capitata* is considered a quarantine pest in the United States. Eradication of the most recent outbreak of *C. capitata* in the United States was declared on 17 June 1996.

⁴ Brazilian officials have indicated that "*Empoasca sp.*" is a pest of papaya in Brazil. We listed this pest as *Empoasca papayae* because *E. papayae* is a known pest of papaya and it is reported to attack papaya in South America.

5. List of Quarantine Pests

Our list of quarantine pests for shipments of *Carica papaya* from Brazil is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of *Carica papaya*, quarantine action may be taken.

Table 3: Quarantine Pests: *Carica papaya* from Brazil

Fungi:	<i>Botryodiplodia</i> spp. <i>Cercospora</i> <i>mamaonis</i> <i>Leptosphaeria</i> spp. <i>Melophia</i> <i>superba</i> <i>Phaeoseptoria</i> <i>papaya</i> <i>Phomopsis</i> <i>carica-papayae</i> <i>Septoria</i> <i>caricae</i>
Bacteria:	<i>Pseudomonas</i> <i>caricapapayae</i>
Unknown etiology:	Freckles
Arthropods:	<i>Aonidiella</i> <i>comperei</i> <i>Anastrepha</i> <i>fraterculus</i> <i>Ceratitis</i> <i>capitata</i> <i>Empoasca</i> <i>papayae</i> <i>Hanseniella</i> sp. <i>Lycorella</i> <i>cleobaea</i> <i>Lycorella</i> <i>halia referrens</i> <i>Stiphra</i> <i>robusta</i> <i>Tiquadra</i> <i>nivosa</i> <i>Xylophanes</i> <i>chiron</i>

6. Quarantine Pests Likely to Follow Pathway (Quarantine Pests Selected for Further Analysis)

We analyzed in detail only those quarantine pests that can reasonably be expected to follow the pathway of commercial shipments of *Carica papaya* (see USDA, 1995 for selection criteria). Only quarantine pests selected for further analysis are subjected to steps 7-9 below.

Table 4: Quarantine Pest Selected for Further Analysis: *Carica papaya* from Brazil

Fungi:	<i>Cercospora mamaonis</i> <i>Phomopsis carica-papayae</i>
Unknown etiology:	Freckles
Arthropods:	<i>Anastrepha fraterculus</i> <i>Ceratitidis capitata</i>

7. Consequences of Introduction: Economic/Environmental Importance

We rate each pest with respect to potential economic importance based on five biological features referred to here as Risk Elements (RE). Details of the five RE's and rating criteria are provided in USDA (1995). Our ratings for these five RE's are shown in Table 5. The cumulative (Total) score for Risk Elements 1-5 (*i.e.*, the "Consequences of Introduction Risk Rating") is considered to be a biological indicator of the potential destructiveness of the pest.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Eco- nomic	Environ- mental	Risk Rating
<i>Anastrepha fraterculus</i>	high	high	high	high	high	high
<i>Ceratitidis capitata</i>	high	high	high	high	high	high
<i>Cercospora mamaonis</i>	medium	low	medium	low	medium	medium
Freckles	medium	low	low	low	low	low
<i>Phomopsis carica-papayae</i>	medium	low	medium	medium	medium	medium

8. Likelihood of Introduction

We rate each pest with respect to introduction (*i.e.*, entry and establishment) potential. We consider two separate components. First, we estimate the amount of commodity likely to be imported. More imports lead to greater risk; the result is a risk rating (0-2) that applies to the commodity and country in question and is the same for all quarantine pests considered. Second, we consider five biological features (*i.e.*, risk elements) concerning the pest and its interactions with the commodity. The resulting risk ratings are specific to each pest. Details of elements and rating criteria are provided in USDA (1995). The cumulative risk rating for introduction is considered to be an indicator of the likelihood that a particular pest would be introduced.

Table 6: Risk Rating: Likelihood of Introduction							
Pest	Quantity of commodity imported annually	Likelihood survive post-harvest treatment	Likelihood survive shipment	Likelihood not detect at port of entry	Likelihood moved to suitable habitat	Likelihood find suitable host	Risk Rating
<i>Anastrepha fraterculus</i>	medium	high	high	high	high	high	high
<i>Ceratitis capitata</i>	medium	high	high	high	high	high	high
<i>Cercospora mamaonis</i>	medium	medium	high	low	low	low	medium
Freckles	medium	medium	high	low	low	low	medium
<i>Phomopsis carica-papayae</i>	medium	medium	high	low	low	low	medium

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The overall risk posed by a particular pest depends on both the consequences and likelihood of introduction (see USDA, 1995). Our rating of the overall pest risk potential (PRP) for each quarantine pest selected for further analysis is shown in Table 8.

Table 7: Pest Risk Potential, Quarantine Pests, <i>Carica papaya</i> from Brazil	
Pest	Pest risk potential
<i>Anastrepha fraterculus</i>	high
<i>Ceratitis capitata</i>	high
<i>Cercospora mamaonis</i>	medium
Freckles	medium
<i>Phomopsis carica-papayae</i>	medium

For pests receiving a PRP risk rating of high (i.e., *Anastrepha fraterculus* and *Ceratitis capitata*), we strongly recommend specific phytosanitary measures, port-of-entry inspection is not considered sufficient to provide phytosanitary security. For pests receiving a medium rating (e.g., *Cercospora mamaonis*, Freckles, *Phomopsis carica-papayae*), APHIS risk assessors may, in some cases, recommend specific mitigation measures. Current port of entry inspection procedures should provide sufficient mitigation. However, if these pests are intercepted on Brazilian papaya fruits, Operational Support staff may establish appropriate sanitary and phytosanitary measures they believe necessary to mitigate pest risk. Detailed examination and choice of appropriate sanitary and phytosanitary measures to mitigate pest risk for particular pests is undertaken as part of the pest risk management phase and is not discussed in this document (except see below for fruit flies). APHIS has not yet determined whether risks associated with importations of *C. papaya* from Brazil can be managed adequately. Nor has it been determined what measures would be used to manage plant pest risk should APHIS proceed with a proposed rule for importations of *C. papaya* from Brazil. APHIS' final decisions regarding importation of *C. papaya* will be based on the results of a complete pest risk analysis. This pest risk assessment is the first stage of the risk analysis and constitutes a primary tool for the rounds of risk management and risk communication to follow.

Several species of quarantine significant fruit flies (see Tables 2 and 3) have always been a legitimate concern regarding importation of fresh papaya fruit from Brazil into the United States. Previous risk assessments agree with our current assessment that the species of fruit flies listed in Table 3 pose a significant and high risk to American agriculture. Both the consequences of introduction and the likelihood of introduction are considered to be unacceptably high without specific mitigation measures in place. Two of those fruit flies satisfy international criteria as quarantine pests. To address these concerns, agricultural producers and quarantine officials in Brazil have worked with USDA to develop a program to mitigate these risks. A risk mitigation plan and research report (Malavasi, *et al.*, 1995) was submitted to USDA by Brazil. USDA has considered Brazil's proposed program and finds that if the program is followed according to the proposal, the risk that fruit flies will follow the pathway is sufficiently low to allow importations of fresh papaya fruit from Brazil under the proposed program.

That is, if the program is followed, the fruit flies are not expected to follow the pathway. Should importation of papaya fruit from Brazil be allowed, inspection by USDA officials will confirm that the program requirements are being met.

C. References

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